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2N6027, 2N6028

Preferred Device

Programmable Unijunction Transistor

Programmable Unijunction Transistor Triggers

Designed to enable the engineer to "program'' unijunction characteristics such as R_{BB}, η, I_V, and I_P by merely selecting two resistor values. Application includes thyristor–trigger, oscillator, pulse and timing circuits. These devices may also be used in special thyristor applications due to the availability of an anode gate. Supplied in an inexpensive TO–92 plastic package for high–volume requirements, this package is readily adaptable for use in automatic insertion equipment.

- Programmable — R_{BB}, η, I_V and I_P
- Low On–State Voltage — 1.5 Volts Maximum @ I_F = 50 mA
- Low Gate to Anode Leakage Current — 10 nA Maximum
- High Peak Output Voltage — 11 Volts Typical
- Low Offset Voltage — 0.35 Volt Typical (R_G = 10 k ohms)
- Device Marking: Logo, Device Type, e.g., 2N6027, Date Code

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
*Power Dissipation Derate Above 25°C	P_F $1/\theta_{JA}$	300 4.0	mW mW/°C
*DC Forward Anode Current Derate Above 25°C	I_T	150 2.67	mA mA/°C
*DC Gate Current	I_G	±50	mA
Repetitive Peak Forward Current 100 μs Pulse Width, 1% Duty Cycle *20 μs Pulse Width, 1% Duty Cycle	I_{TRM}	 1.0 2.0	Amps
Non–Repetitive Peak Forward Current 10 μs Pulse Width	I_{TSM}	5.0	Amps
*Gate to Cathode Forward Voltage	V_{GKF}	40	Volts
*Gate to Cathode Reverse Voltage	V_{GKR}	−5.0	Volts
*Gate to Anode Reverse Voltage	V_{GAR}	40	Volts
*Anode to Cathode Voltage(1)	V_{AK}	±40	Volts
Operating Junction Temperature Range	T_J	–50 to +100	°C
*Storage Temperature Range	T_{stg}	–55 to +150	°C

*Indicates JEDEC Registered Data

(1) Anode positive, R_{GA} = 1000 ohms
Anode negative, R_{GA} = open

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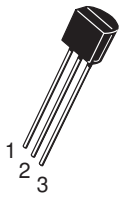
PUTs
40 VOLTS
300 mW



TO–92 (TO–226AA)
CASE 029
STYLE 16

PIN ASSIGNMENT	
1	Anode
2	Gate
3	Cathode

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

THERMAL CHARACTERISTICS

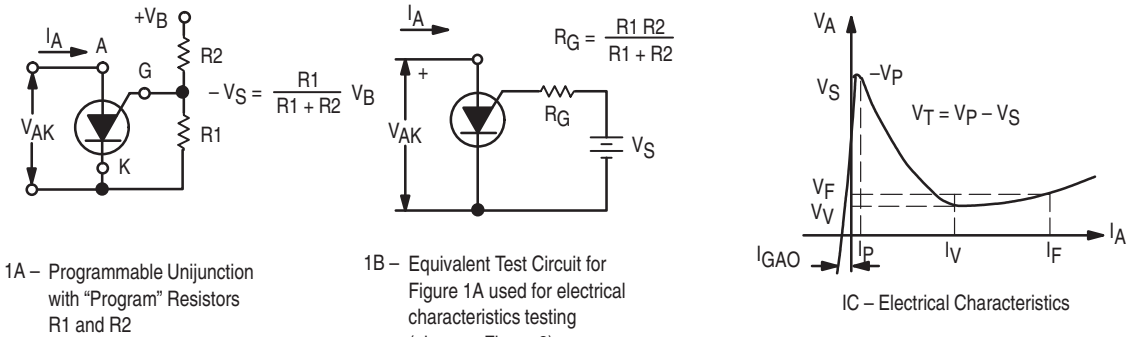
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	75	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W
Maximum Lead Temperature for Soldering Purposes (< 1/16″ from case, 10 secs max)	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic		Fig. No.	Symbol	Min	Typ	Max	Unit
*Peak Current		2,9,11	I_P				μA
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			—	1.25	2.0	
	2N6028			—	0.08	0.15	
(V_S = 10 Vdc, R_G = 10 k ohms)	2N6027			—	4.0	5.0	
	2N6028			—	0.70	1.0	
*Offset Voltage		1	V_T				Volts
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			0.2	0.70	1.6	
	2N6028			0.2	0.50	0.6	
(V_S = 10 Vdc, R_G = 10 k ohms)	(Both Types)			0.2	0.35	0.6	
*Valley Current		1,4,5	I_V				μA
(V_S = 10 Vdc, R_G = 1 MΩ)	2N6027			—	18	50	
	2N6028			—	18	25	
(V_S = 10 Vdc, R_G = 10 k ohms)	2N6027			70	150	—	
	2N6028			25	150	—	
(V_S = 10 Vdc, R_G = 200 ohms)	2N6027			1.5	—	—	mA
	2N6028			1.0	—	—	
*Gate to Anode Leakage Current		—	I_{GAO}				nAdc
(V_S = 40 Vdc, T_A = 25°C, Cathode Open)				—	1.0	10	
(V_S = 40 Vdc, T_A = 75°C, Cathode Open)				—	3.0	—	
Gate to Cathode Leakage Current (V_S = 40 Vdc, Anode to Cathode Shorted)		—	I_{GKS}	—	5.0	50	nAdc
*Forward Voltage (I_F = 50 mA Peak)(1)		1,6	V_F	—	0.8	1.5	Volts
*Peak Output Voltage (V_G = 20 Vdc, C_C = 0.2 μF)		3,7	V_o	6.0	11	—	Volt
Pulse Voltage Rise Time (V_B = 20 Vdc, C_C = 0.2 μF)		3	t_r	—	40	80	ns

*Indicates JEDEC Registered Data

(1) Pulse Test: Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.



1A – Programmable Unijunction with "Program" Resistors R1 and R2

1B – Equivalent Test Circuit for Figure 1A used for electrical characteristics testing (also see Figure 2)

IC – Electrical Characteristics

Figure 1. Electrical Characterization

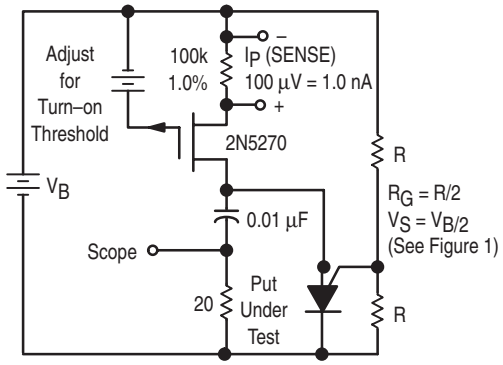


Figure 2. Peak Current (Ip) Test Circuit

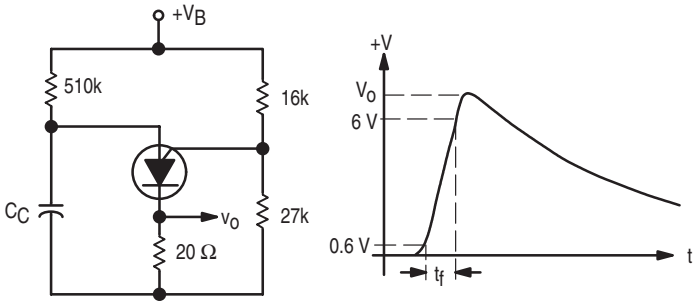


Figure 3. V_O and t_r Test Circuit

TYPICAL VALLEY CURRENT BEHAVIOR

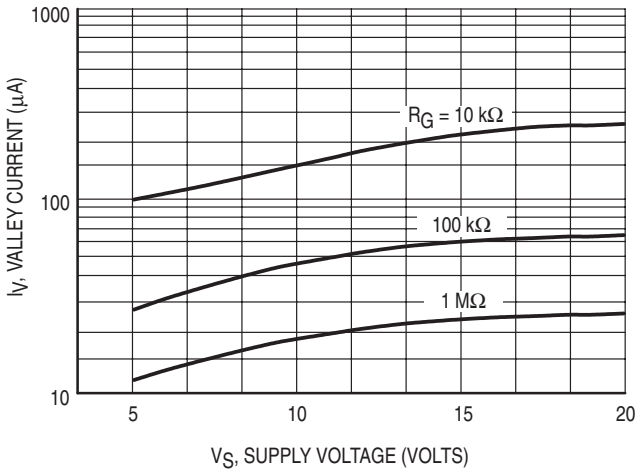


Figure 4. Effect of Supply Voltage

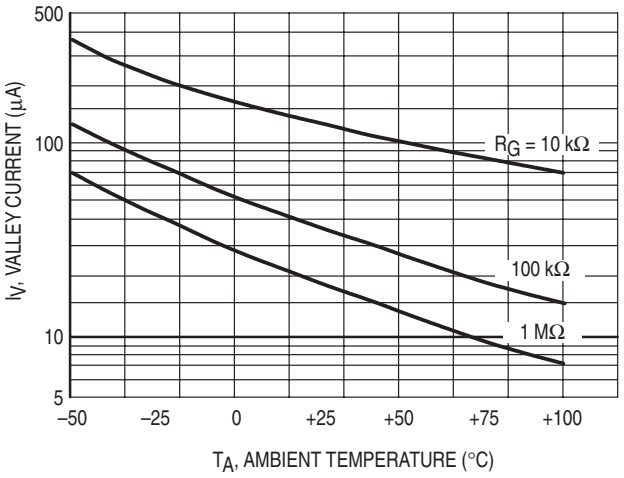


Figure 5. Effect of Temperature

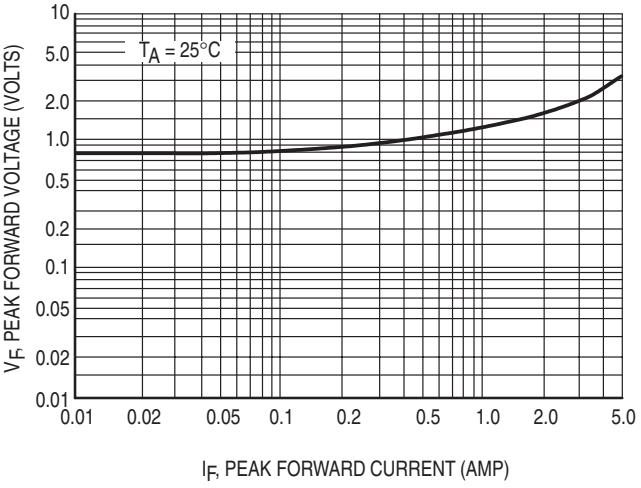


Figure 6. Forward Voltage

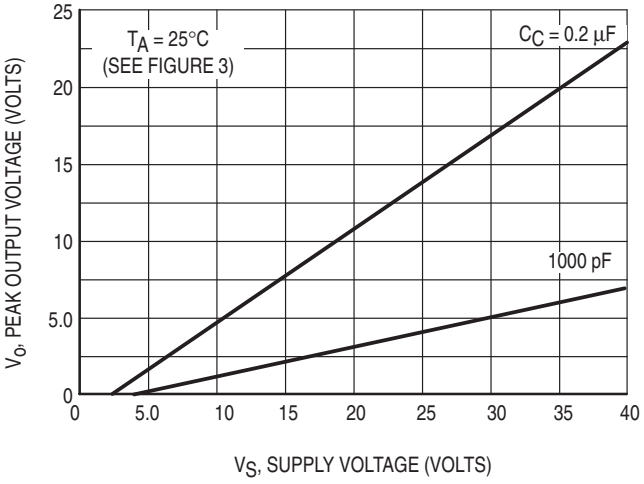


Figure 7. Peak Output Voltage

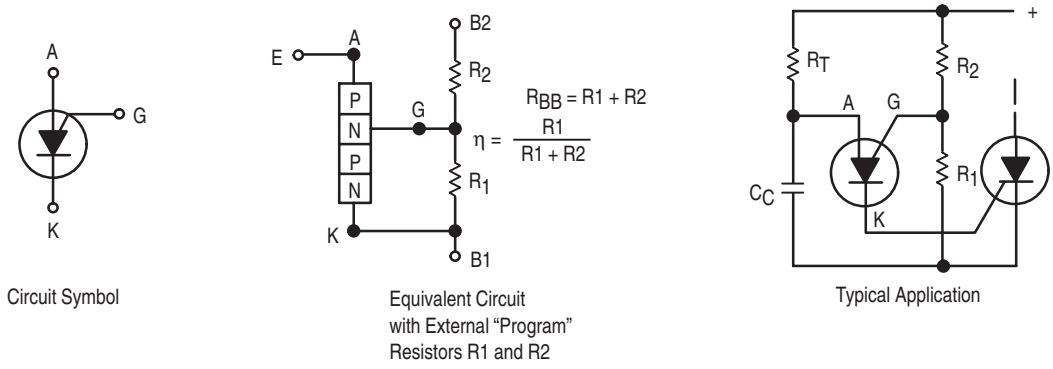


Figure 8. Programmable Unijunction

TYPICAL PEAK CURRENT BEHAVIOR

2N6027

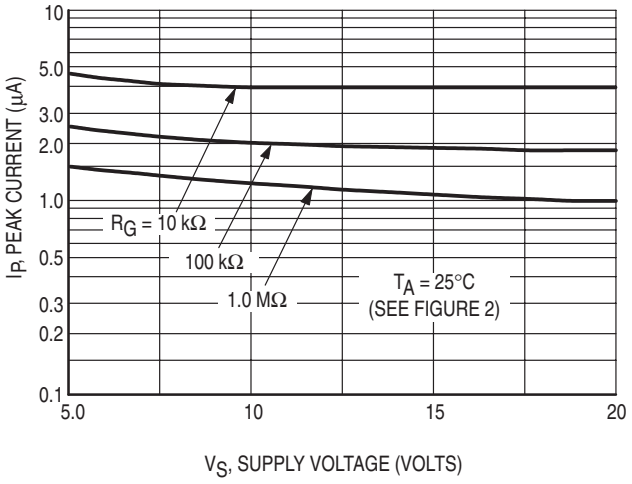


Figure 9. Effect of Supply Voltage and R_G

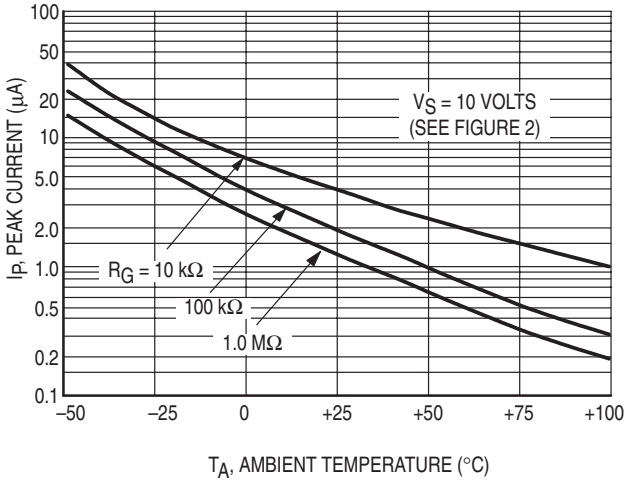


Figure 10. Effect of Temperature and R_G

2N6028

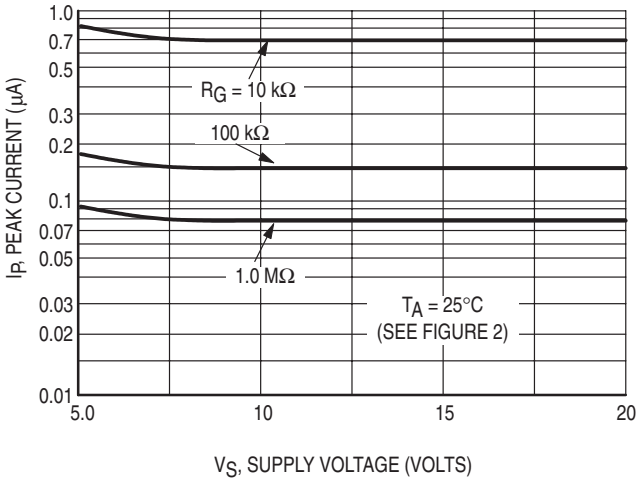


Figure 11. Effect of Supply Voltage and R_G

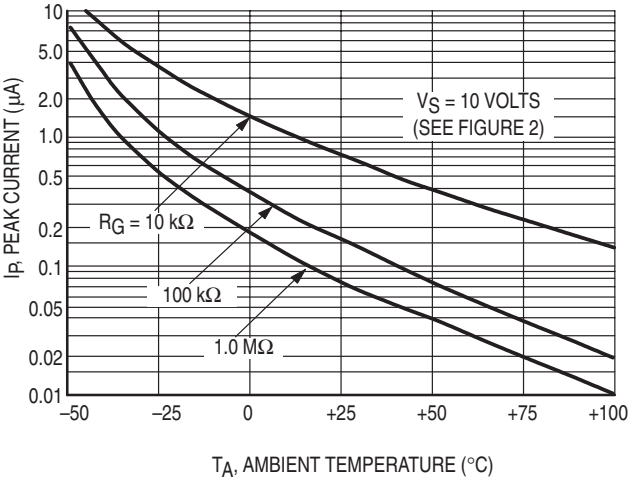


Figure 12. Effect of Temperature and R_G

TO–92 EIA RADIAL TAPE IN FAN FOLD BOX OR ON REEL

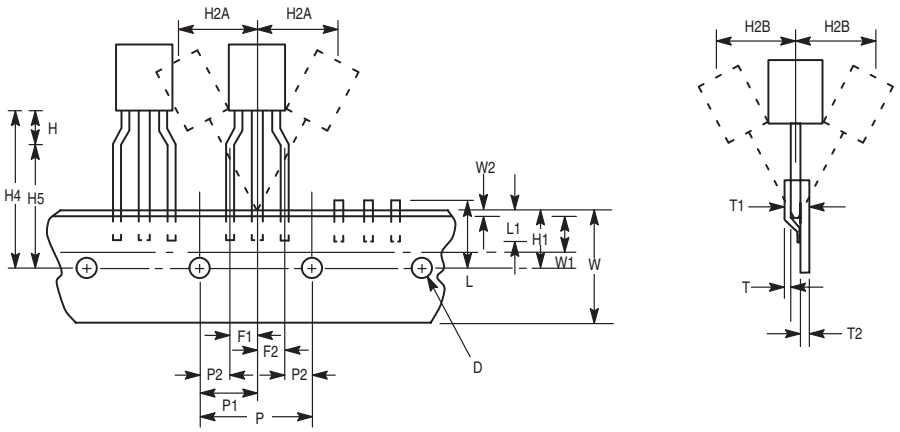


Figure 13. Device Positioning on Tape

Symbol	Item	Specification			
		Inches		Millimeter	
		Min	Max	Min	Max
D	Tape Feedhole Diameter	0.1496	0.1653	3.8	4.2
D2	Component Lead Thickness Dimension	0.015	0.020	0.38	0.51
F1, F2	Component Lead Pitch	0.0945	0.110	2.4	2.8
H	Bottom of Component to Seating Plane	.059	.156	1.5	4.0
H1	Feedhole Location	0.3346	0.3741	8.5	9.5
H2A	Deflection Left or Right	0	0.039	0	1.0
H2B	Deflection Front or Rear	0	0.051	0	1.0
H4	Feedhole to Bottom of Component	0.7086	0.768	18	19.5
H5	Feedhole to Seating Plane	0.610	0.649	15.5	16.5
L	Defective Unit Clipped Dimension	0.3346	0.433	8.5	11
L1	Lead Wire Enclosure	0.09842	—	2.5	—
P	Feedhole Pitch	0.4921	0.5079	12.5	12.9
P1	Feedhole Center to Center Lead	0.2342	0.2658	5.95	6.75
P2	First Lead Spacing Dimension	0.1397	0.1556	3.55	3.95
T	Adhesive Tape Thickness	0.06	0.08	0.15	0.20
T1	Overall Taped Package Thickness	—	0.0567	—	1.44
T2	Carrier Strip Thickness	0.014	0.027	0.35	0.65
W	Carrier Strip Width	0.6889	0.7481	17.5	19
W1	Adhesive Tape Width	0.2165	0.2841	5.5	6.3
W2	Adhesive Tape Position	.0059	0.01968	.15	0.5

NOTES:

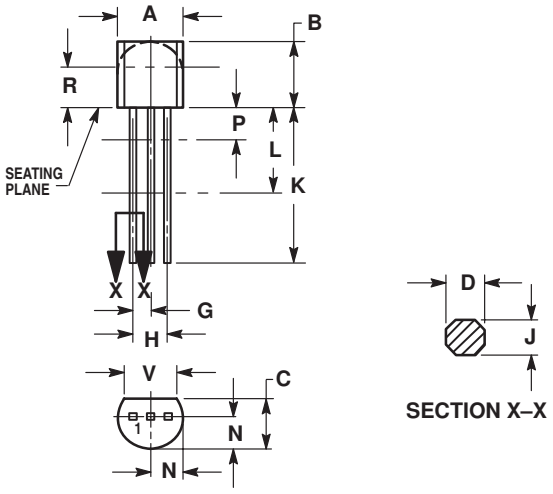
1. Maximum alignment deviation between leads not to be greater than 0.2 mm.
2. Defective components shall be clipped from the carrier tape such that the remaining protrusion (L) does not exceed a maximum of 11 mm.
3. Component lead to tape adhesion must meet the pull test requirements.
4. Maximum non–cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
5. Holddown tape not to extend beyond the edge(s) of carrier tape and there shall be no exposure of adhesive.
6. No more than 1 consecutive missing component is permitted.
7. A tape trailer and leader, having at least three feed holes is required before the first and after the last component.
8. Splices will not interfere with the sprocket feed holes.

ORDERING & SHIPPING INFORMATION: 2N6027 and 2N6028 packaging options, Device Suffix

U.S.	Europe Equivalent	Shipping	Description of TO92 Tape Orientation
2N6027, 2N6028		Bulk in Box (5K/Box)	N/A, Bulk
2N6027, 2N6028RLRA		Radial Tape and Reel (2K/Reel)	Round side of TO92 and adhesive tape visible
	2N6027RL1	Radial Tape and Reel (2K/Reel)	Flat side of TO92 and adhesive tape visible
2N6028RLRM		Radial Tape and Fan Fold Box (2K/Box)	Flat side of TO92 and adhesive tape visible
2N6028RLRP		Radial Tape and Fan Fold Box (2K/Box)	Round side of TO92 and adhesive tape visible

PACKAGE DIMENSIONS

TO–92 (TO–226AA)
CASE 029–11
ISSUE AJ



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

STYLE 16:
PIN 1. ANODE
2. GATE
3. CATHODE

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